

SURGICAL INSTRUMENT HANDLE
WITH ADJUSTABLE ACTUATOR POSITION

Brief Description of the Drawings

Features of the invention are set forth in the following detailed description of the preferred embodiment of the invention and in the following drawing figures wherein:

5 Figure 1 is a cross section of the instrument handle of the invention;
and,

 Figure 2 is a view of the disassembled component parts of the
instrument handle of the invention.

Detailed Description of the Preferred Embodiment

10 The surgical instrument handle of the invention is employed with
microsurgical instrument heads of the type disclosed in the U.S. Patent of
Scheller *et al.* No. 5,370,658, and the U.S. Patent of Gampp, Jr. *et al.*
No. 5,893,877, both of which are incorporated herein by reference. The
surgical instrument heads disclosed in these patents have surgical
15 instruments at their distal ends that are actuated in response to reciprocating

movement of head pistons at their proximal ends. The instrument handle of the invention is designed to be attached to surgical instrument heads of the type disclosed in the above referenced patents to actuate the surgical instruments of the instrument heads.

5 The instrument handle of the invention is manually actuated in a manner to be described, to move a piston on the instrument handle that in turn moves the head piston of the surgical instrument head attached to the handle. In this way, the instrument handle of the invention actuates the surgical instrument head of the type described in the above referenced
10 patents. In operation of the instrument handle of the invention, the handle piston is moved against a spring-biased piston of the instrument head to produce a first stage of movement in the surgical instrument at the distal end of the instrument head. The bias on the instrument head piston against the piston of the instrument handle causes the surgical instrument at the
15 instrument head distal end to move from its first stage of movement to its second stage of movement.

 The surgical instrument handle of the invention is basically comprised of an interior assembly and an exterior assembly. The interior assembly includes a cylindrical base 12, an elongate rod 14, a piston 16, a ring 18, a
20 piston stop 22, and a rear cap 24.

 The cylindrical base 12 has a center axis with opposite proximal 26 and distal 28 ends. External screw threading 32 is provided on the exterior of the base adjacent the base proximal end 26. A center bore 34 extends through the base. A pinhole 36 extends transversely through the base and intersects

the center bore 34. Internal screw threading 37 is provided in the center bore 34 adjacent the base proximal end 26.

The elongate rod 14 has a center axis and opposite proximal 38 and distal 42 ends. A pinhole 44 extends transversely through the rod proximal end 38. A surgical instrument head connector 46 having external screw
5 threading is provided at the rod distal end 42. The instrument connector 46 has an axial center bore 48. A piston slot 52 extends transversely through the rod 14 and extends axially along the rod for a short distance adjacent the instrument connector 46. The slot 52 intersects the instrument connector
10 center bore 48.

The piston 16 is received in the rod slot 52 for reciprocating axial movement of the piston through the rod slot. The piston 16 has a pair of transversely extending shoulders 54 intermediate the opposite proximal 56 and distal 58 ends of the piston. The piston distal end 58 projects from the
15 pair of shoulders 54 through the center bore 48 of the rod instrument connector 46.

The ring 18 is mounted on the rod 14 for axial sliding movement of the ring. The ring has an annular cavity 62 recessed into a distal end face 64 of the ring. The annular cavity 62 receives the piston shoulders 54 to operatively
20 connect the piston 16 with the ring 18. A proximal end face 66 of the ring 18 is formed as a conical sliding surface.

The piston stop 22 is cylindrical and has a center bore 68 that receives the elongate rod 14. The piston stop 22 is positioned adjacent the slot 52 in the rod distal end. A set screw 72 is received in an internally threaded hole

74 in the side of the piston stop 22 and engages with the elongate rod 14 to secure the piston stop in a desired position on the rod. The position of the piston stop 22 on the rod 14 limits the movement of the piston 16 toward the rod proximal end 38.

- 5 The rear cap 24 is provided with an externally threaded shank 76 and a cylindrical head 78. The screw threads on the rear cap shank 76 are screwed into the internal screw threading 37 at the base proximal end 26 closing the hollow interior of the base at its proximal end.

- The exterior assembly of the surgical instrument handle is comprised of
- 10 a tubular forward grip member 82, a tubular rearward grip member 84, and a pin 86. The forward grip member 82 has a center bore 87 with a center axis extending through the length of the grip member. The bore 87 extends from a proximal end 88 to a distal end 92 of the grip member. A pair of diametrically opposed elongate slots 94 are formed transversely through the forward grip
- 15 member 82 adjacent the proximal end 88. The slots 94 extend axially along a portion of the length of the forward grip member adjacent the proximal end 88. A portion of the forward grip member interior bore surface 96 tapers radially outwardly as it extends from the interior bore to the forward grip member distal end 92. A plurality of axially extending slots 98 are formed in the
- 20 forward grip member 82 at the forward grip member distal end 92. The axial slots 98 extend along the length of the forward grip member 82 from the distal end 92, but end short of the forward grip member proximal end 88. The axial slots 98 form a plurality of resilient arms 102 that are circumferentially arranged around the interior bore 87 of the forward grip member.

The rearward grip member 84 is a cylindrical tube having opposite proximal 104 and distal 106 ends. The exterior surface of the rearward grip member 84 is smooth. Internal screw threading 108 is provided inside the rearward grip member 84 adjacent the distal end 106. The internal screw
5 threading 108 is complementary to the external screw threading 32 of the base 12.

The surgical instrument handle is assembled by first positioning the piston 16 in the slot 52 at the rod distal end 42. The ring 18 is then positioned over the rod and the piston shoulders 54 are received in the ring annular
10 cavity 62. The piston stop 22 is then positioned over the rod adjacent the slot 52. The piston stop 22 is secured in its desired position adjacent the slot 52 by tightening the set screw 72 in the set screw hole 74 of the stop. The elongate rod proximal end 38 is then inserted into the base center bore 34 at the base distal end 28. The pinhole 44 of the rod is aligned with the pinhole
15 36 of the base.

The exterior assembly of the instrument handle is then assembled onto the interior assembly. The forward grip member 82 is positioned over the elongate rod 14 and over the proximal end 26 of the base 12. The pin slots 94 of the forward grip member 82 are aligned with the base pinhole 36 and
20 the rod pinhole 44 and the pin 86 is inserted through the aligned holes and slots. This secures the rod 14 to the base 12, and mounts the forward grip member 82 to the rod and base for limited axial movement of the forward grip member 82 relative to the rod 14 and base 12.

The rearward grip member 84 is then mounted to the base 12 by screw threading the internal screw threads 108 at the distal end 106 of the rearward grip member onto the external screw threads 32 of the base. The rearward grip member 84 is screw threaded onto the base 12 until the distal end 106 of the rearward grip member 84 engages against the proximal end 88 of the forward grip member 82. The rear cap 24 is then screw threaded into the internal screw threading 37 at the base proximal end 26. The head 78 of the rear cap prevents the rearward grip member 84 from being removed from the instrument handle by screw threading the rearward grip member 84 off of the base 12.

With the instrument assembled as shown in Figure 1, it should be appreciated that manually compressing the distal ends 92 of the forward grip member 82 will exert a compressive force on the conical sliding surface 66 of the ring 18. This will cause the ring 18 to move axially toward the rod distal end 42. This in turn causes the piston 16 to move through the piston slot 52 toward the rod distal end 42. This movement of the piston will actuate the surgical instrument of a surgical instrument head of the type described in the earlier referenced U.S. patents.

Releasing the manual compressive force on the distal end 92 of the forward grip member 82 will allow the piston 16 to move toward the rod proximal end 38 in response to the biasing force of the surgical instrument head attached to the instrument handle. This also results in movement of the ring 18 toward the rod proximal end 38. As the ring 18 moves the ring

proximal end face 66 pulses the forward grip member distal ends 92 back to their original positions.

The novel construction of the instrument handle of the invention enables the radial spacing between the distal ends 92 of the forward grip member arms 102 to be adjusted to the desired comfort of the user. Turning the rearward grip member 84 in a first, clockwise direction relative to the forward grip member 82 will cause the forward grip member 82 to move axially along the rod 14. The movement of the forward grip member 82 is determined by the length of the axial slots 94 in the forward grip member 82. Movement of the forward grip member distal end 92 toward the rod distal end 42 will cause the distal ends 92 of the forward grip member arms 102 to expand radially outwardly as they slide over the ring proximal end surface 66. Thus, this adjustably increases the radial spacing between diametrically opposite distal ends 92 of the forward grip member arms 102. Rotating the rearward grip member 84 in a second, counterclockwise direction relative to the forward grip member 82 will allow the forward grip member 82 to move axially toward the proximal end 38 of the rod 14. This allows the distal ends 92 of the forward grip member arms 102 to slide radially inwardly, over the ring proximal end surface 66. This reduces the radial spacing between diametrically opposite distal ends 92 of the forward grip member arms 102.

Thus, in the manner discussed above, the instrument handle of the invention enables radially adjusting the width of the operative portion of the instrument handle adjacent the forward grip member distal ends 92 to suit the comfort of the user.

Although a specific embodiment of the invention has been described above, it should be understood that other modifications and variations may be made to the invention without departing from the intended scope of protection provided by the following claims.